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E. V. WILCOX, Special Agent in Charge

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Carbon Bisulphid for Killing Weeds

By E. V. WILCOX,

Special Agent in Charge, Hawaii Agricultural Experiment Station, United States Department of Agriculture.

In the perpetual conflict with weeds it becomes necessary to make use of every weapon which shows efficiency in destroying them. The conditions under which different crops are raised indicate different methods as best adapted to the various conditions of each case. During the past year a number of experiments have been made with carbon bisulphid in studying its effects upon various herbaceous and shrubby weeds. In these experiments, the amount of carbon bisulphid used varied according to the size of the plant to be destroyed. On small-stemmed plants like *Crotalaria,* about a teaspoonful of commercial bisulphid was poured down the stem, from about six inches above the ground. The amount was increased, for larger plants, up to two tablespoonfuls for guava bushes three or four inches in diameter. The plants upon which most of the tests were made were lantana, guava, prickly-pear, *Stachytarpheta dicotoma* (one of the plants known by the native name Oi), and *Crotalaria incana.* In all cases, as just indicated, the carbon bisulphid was poured on the stem at a point about six inches above the surface of the ground. On most plants carbon bisulphid shows no effect until after the lapse of a considerable

period; on large guavas sometimes two or three months. The effect of pouring carbon bisulphid on *Crotalaria* was to cause the death of the plant, root and branches, within four to ten days. The plants remain green, and apparently normal, until shortly before death, when the leaves suddenly turn yellow and shrivel up. If the plants are then carefully removed from the soil it is found that all of the root-system is dead and the inner tissues of the roots and lower part of the stem are brown, or otherwise discolored.

Lantana bushes, about two inches in diameter, died within seventeen to thirty-two days after the application of carbon bisulphid. About the same length of time was required for the destruction of Oi. Young prickly-pear plants, about two feet in height, were found to be exceedingly sensitive to carbon bisulphid. In some cases, the plants fell over on the ground within twenty-four hours after being moistened with the liquid; and in other cases, were dead within two days.

With guava, the effects of carbon bisulphid were not manifested for a much longer period, in some cases even not for two or three months. Finally, however, in all but two cases the leaves turned yellow, withered up, and the plant died. The dead and dying trees were dug out and the roots examined. In every case the roots were found to be dead to the tip and their whole tissue discolored. In one case, the guava tree was over six inches in diameter at the base.

Apparently, the effect of carbon bisulphid, when applied directly to the stems of plants, is due to artificial freezing. As is well known, the liquid volatilizes almost instantly and cools the surface so suddenly that the living bark is destroyed. It was found to be a simple matter to produce ice at noon on hot days on the surface of guavas and other plants by slowly dripping carbon bisulphid along the trunk. The death of large guavas from an application of a small quantity of carbon bisulphid to the base of the trunk, a few inches above the ground, can hardly be attributed entirely to the freezing effect. It seems also to exercise a poisonous action, otherwise it would be difficult to explain the complete destruction of the roots to

their tips, in some instances, six or eight feet from the point where the carbon bisulphid was applied. It was found, for example, that guava bushes would live for five to seven months after the bark and cambium had been entirely removed from the surface of the ground up to a height of two feet. Moreover, the destruction of the bark at the base of the trunk by concentrated sulphuric acid was not sufficient to cause the death of the guava bush for about six months. Apparently, therefore, carbon bisulphid causes the death of plants by its freezing effect and also by a poisonous action.

The use of carbon bisulphid for destroying underground insects is a familiar practice. It may be interesting, therefore, to inquire what effect, if any, the extensive use of carbon bisulphid may have upon the soil and its adaptability to cultivation. It is well known, for example, that the application of carbon bisulphid to the soil around fruit trees and other plants has no injurious effect upon the plants; in fact, [1]Hiltner and Stõrmer have shown that carbon bisulphid reduces denitrification and the fixation of nitrogen. Similarly, [2]Heinze demonstrated that carbon bisulphid promotes the activity of nitrogen-fixing organisms. In experiments carried on by Nobbe, the yield of peas, and various other crops, was increased as a result of the application of carbon bisulphid and the plants absorbed more ash and nitrogen. [3]Henry found that when 400 cc. of carbon bisulphid per square meter was injected into the soil about locust trees, beneficial effects upon the growth of the trees were observed for several years. On the other hand, heavy fumigation with carbon bisulphid has frequently proved injurious or fatal to young fruit trees. In a series of experiments by [4]Oberlin, carried on for eighteen years, in treating grape *Phylloxera,* it was found that carbon bisulphid had a remarkable effect in increasing the yield of grapes. When other crops were rotated with grapes, for example, legumes,

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1. L. Hiltner and K. Stormer, Arb. K. Gesundheitsamte, Biol. Abt. 3 (1903) pp. 443-545.
2. B. Heinze, Centbl. Bakt., etc., 2 Abt. 16 (1906) pp. 329-358.
3. E. Henry, Bul. Soc. Sci. Nancy, 3 Ser. 2 (1901) pp. 27-33.
4. C. Oberlin, Jour. Agr. Prat. 59 (1895) pp. 459-464, 499-503, 535-540.

sugar-beets, and cereals, a considerably increased yield was also noted in these plants. In a few instances, it appeared that soil made "sick" by continuous culture of the same crop was restored to productiveness by the use of carbon bisulphid.

Apparently the only previous experiments with carbon bisulphid, as a weed-destroyer, were carried out by Walker in Arkansas in destroying sassafras sprouts, and by the writer, in Maryland, also on sassafras. In both of these localities the chemical was found to produce the death of the plants within one month.

In using carbon bisulphid it should always be remembered that the fumes, if inhaled continuously, may produce serious effects upon the workmen, and also that the material is highly inflammable and should be protected from accidental flames. The effects of the fumes upon workmen include headache, dizziness, hysterical excitement, and, finally, a rather serious weakness, a feeble pulse and other symptoms of prostration. If it is used, therefore, in the eradication of weeds, these effects should be borne in mind in order to protect the workmen.

It is obvious that carbon bisulphid, although an effective means of destroying certain weeds, cannot be used economically in all localities. There are many steep slopes covered with guavas, in which it would be a very difficult matter to operate with this chemical. It is always necessary for the workmen to keep to the windward, in order to avoid the fumes, and in some localities the difficulty of transporting containers would render the method entirely impracticable. On the other hand, the use of carbon bisulphid in the destruction of such plants as the guava has the advantage that young sprouts do not come up from the roots. The necessity of grubbing out all of the roots is thus obviated. Under such circumstances, it would merely be necessary to allow the guavas to stand until they are dead, after which the trunk and large roots would be removed, as is necessary in any case in clearing the land.